

United States Department of Agriculture



Natural Resources Conservation Service
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NATIONAL RANGE AND PASTURE HANDBOOK
190-VI
IDAHO NOTICE 1

The attached "Guide to Pasture Condition Scoring," and "Pasture Condition Score Sheet," are to be used in evaluating pasture productivity and stability and to identify treatment needs.

Filing Instructions: One copy each of the "Guide to Pasture Condition Scoring," and "Pasture Condition Score Sheet" are to be filed in the **appendix** of the National Pasture and Range Handbook. The second copy of each publication is for use in the field. Additional copies may be downloaded at the GLTI web page:

<http://www.ftw.nrcs.usda.gov/glti/pubs.html>

Also attached is a tabulation sheet to be filed in the front of the manual.

If you have any questions please call Jim Cornwell, Range Management Specialist (208) 378-5722.

A handwritten signature in black ink that reads "Lee E. Brooks".

LEE E. BROOKS
Assistant State Conservationist (TS)

Attachments

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NATIONAL RANGE AND PASTURE HANDBOOK

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Pasture Condition Score Sheet

Purposes

- Evaluate current pasture productivity and the stability of its plant community, soil, and water resources.
- Identify what treatment needs, if any, are required to improve a pasture's productivity and protect soil, water, and air quality.

Suggested uses

This score sheet may be used to rate different pastures in a single growing season or the same pasture over a period of years. Rating a pasture yearly can track trends, either improvement or decline, in its condition. Some indicators change slowly in response to stresses caused by management or climate. Also, some indicators may change as each season progresses. An indicator or causative factor may rank high at one time and low another. Uniformity of use, plant residue, percent legume, severity of use, weather, and insect or disease pressure can vary widely on the same pasture depending on when they are scored during the year and the degree of management the pasture receives. Therefore, it is often wise to score a pasture at different, key times during the year before deciding to make changes in management. Indicate on the form the date the scoring occurred.

Procedure

Step 1—Rate each pasture one by one that is occupied all at the same time by a herd or flock and separated from other pasture areas by portable or fixed fencing. Paddocks in rotational pastures may be rated separately or as a combined unit. It depends on how alike they are. If any indicator looks markedly different from paddock to paddock, it may pay to rate each one separately.

Step 2—Score all 10 indicators regardless of your feelings of their relative worth. To learn or recall how each indicator reflects on how well a pasture is being managed, see *Guide to Pasture Condition Scoring*.

Step 3—Using the attached score sheet and indicator criteria, read the scoring criteria for each of the 10 pasture condition indicators one at a time and rate before moving onto the next. Use the 1 to 5 scale provided. Estimate by eye or measure as precisely as you feel is needed to rate the indicator reliably.

Step 4—When scoring plant vigor, enter a score based on the general criteria given on page 2 using the most limiting trait listed. Use this number to determine the overall pasture score. If the plant vigor score is less than 4, refer to the plant vigor causative factors' criteria on page 6 to identify the plant stress(es) causing reduced vigor. Rate each causative factor independently on the score sheet provided on page 5. Do not average to adjust the original vigor score.

Step 5—When scoring erosion, rate sheet and rill erosion every time. Rate other types of erosion only if present. When present, indicate which one(s) by identifying the erosion type with a unique symbol next to its score. Divide the box as needed to score them separately. Erosion is rated by averaging the individual scores. A need remains to prioritize which erosion problem is controlled first and how.

Step 6—Total the score for each pasture and compare to the following chart. Also, focus on any low scoring individual indicators or causative factors.

Pasture condition score		Management change suggested
Overall	Individual	
45–50	5	No changes in management needed at this time.
35–45	4	Minor changes would enhance, do most beneficial first.
25–35	3	Improvements benefit productivity and/or environment.
15–25	2	Needs immediate management changes, high return likely.
10–15	1	Major effort required in time, management, and expense.

Step 7—When an individual indicator's score falls below a 5, determine its worth to your operation. Then, decide whether to correct the cause or causes for the low rating. If you choose to correct, apply the most suitable management options for your area and operation.

Authors: **Dennis Cosgrove** is associate professor of agronomy, University of Wisconsin-River Falls and University of Wisconsin-Extension, Cooperative Extension. **Dan Undersander** is professor of agronomy, College of Agricultural and Life Sciences, University of Wisconsin-Madison and University of Wisconsin-Extension, Cooperative Extension. **James Cropper** is forage management specialist, USDA-Natural Resources Conservation Service, Grazing Lands Technology Institute. Authors extend their thanks to Extension and NRCS reviewers for their input on technical content.

Pasture Condition Score Sheet

Indicator	1	2	Score 3	4	5
Percent desirable plants	Desirable species < 20% of stand. Annual weeds and/or woody species dominant.	Desirable species 20–40% of stand. Mostly weedy annuals and/or woody species present and expanding. Shade a factor.	40–60% desirable forage species. Undesirable broad-leaf weeds and annual weedy grasses invading. Some woodies.	60–80% of plant community are desirable species. Remainder mostly intermediates and a few undesirables present.	Desirable species exceed 80% of plant community. Scattered intermediates.
Plant cover (Live stems and green leaf cover of all desirable and intermediate species.)	Canopy: < 50% Basal area: < 15% Photosynthetic area very low. Very little plant cover to slow or stop runoff.	Canopy: 50–70% Basal area: 15–25% Photosynthetic area low. Vegetal retardance to runoff low.	Canopy: 70–90% Basal area: 25–35% Most forages grazed close, little leaf area to intercept sunlight. Moderate vegetal retardance.	Canopy: 90–95% Basal area: 35–50% Spot grazed low and high so some loss of photosynthetic potential. Vegetal retardance still high.	Canopy: 95–100% Basal area: >50% Forages maintained in leafy condition for best photosynthetic activity. Very thick stand, slow or no runoff flows.
Plant diversity	One dominant (> 75% of DM wt.) forage species. Or, over 5 forage species (all <20%) from one dominant functional group, not evenly grazed - poorly distributed.	Two to five forage species from one dominant functional (>75% of DM wt.) group. At least one avoided by livestock permitting presence of mature seed stalks. Species in patches.	Three forage species (each 20% of DM wt.) from one functional group. None avoided. Or, one forage species each from two functional groups, both supply 25–50% of DM wt.	Three to four forage species (each 20% of DM wt.) with at least one being a legume. Well intermixed, compatible growth habit, and comparable palatability.	Four to five forage species representing three functional groups (each 20% of DM wt.) with at least one being a legume. Intermixed well, compatible growth habit, and comparable palatability.
Plant residue (Rate ground cover and standing dead forage separately and average score.)	Ground cover: No identifiable residue present on soil surface. Or, heavy thatch evident (> 1 inch). Standing dead forage: >25% of air dry weight.	Ground cover: 1–10% covered with dead leaves or stems. Or, thatch 0.5 inch to 1 inch thick. Standing dead forage: 15–25% of air dry weight.	Ground cover: 10–20% covered with dead residue. Or, slight thatch buildup but < 0.5 inch. Standing dead forage: 5–15% of air dry weight.	Ground cover: 20–30% covered with dead residue. No thatch present. Standing dead forage: some, but < 5% of air dry weight.	Ground cover: 30–70% covered with dead residue, but no thatch buildup. Standing dead forage: none available to grazing animal.
Plant vigor <i>If plant vigor rating is less than 4, determine cause by rating 6 possible causes listed on page 5.</i>	No recovery after grazing or pale yellow or brown, or permanent wilting, or plant loss due to insects or disease, exercise lot only. Or, lodged, dark green overly lush forage. Often avoided by grazers.	Recovery after grazing takes 3 or more weeks longer than normal, or yellowish green leaves, or major insect or disease yield loss, or plants wilted most of day. Productivity very low.	Recovery after grazing takes 1 week longer than normal, or urine/dung patches dark green in contrast to rest of plants, or minor insect or disease loss or mid-day plant wilting. Yields regularly below site potential.	Recovery after grazing takes 1 to 2 days longer than normal, or light green plants among greener urine and dung patches, or minor insect or disease damage. No plant wilting. Yields near site potential.	Rapid recovery after grazing. Healthy green color. No signs of insect or disease damage. No leaf wilting. Yields at site potential for the species adapted to the site's soil and climate.
Percent legume (Cool season stands. See footnote 3 of score sheet for warm season)	< 10% by wt. Or, greater than 60% of bloating legumes.	10–19% legumes. Or, losing grass, 40–60% spreading legume.	20–29% legumes.	30–39% legumes.	40–60% legumes. No grass loss; grass may be increasing.
Uniformity of use	Little-grazed patches cover over 50% of the pasture. Mosaic pattern throughout or identifiable areas of pasture avoided.	Little-grazed patches cover 25–50% of the pasture either in a mosaic pattern or obvious portion is not frequented.	Little-grazed patches cover 10–25% of the pasture either in a mosaic pattern or obvious portion is not frequented.	Little-grazed patches minor spots where isolated forage species is rejected. Urine and dung patches avoided.	Rejected areas only at urine and dung patches. No forage species rejection.

Pasture Condition Score Sheet

Indicator	1	2	Score 3	4	5
Livestock concentration areas	Cover >10% of the pasture; or all convey contaminated runoff directly into water channels.	Livestock conc. areas and trails cover 5–10% of pasture; most close to water channels and drain into them unbuffered.	Isolated livestock conc. areas and trails <5% of area; one close to water channel and drains into it unbuffered.	Some livestock trails and one or two small concentration areas. Buffer areas between them and water channels.	No presence of livestock concentration areas or heavy use areas sited or treated to minimize contaminated runoff.
Soil compaction	Infiltration capacity and surface runoff severely affected by heavy compaction. Excessive livestock traffic killing plants over wide areas. Very hard to push probe into soil without damaging the probe.	Infiltration capacity lowered and surface runoff increased due to large areas of bare ground and dense compaction layer at surface. Livestock trails common throughout. Off-trail hoof prints common. Hard to push probe past compacted layers.	Infiltration capacity lowered and surface runoff increased due to plant cover loss and soil compaction by livestock hooves. Soil resistant to soil probe entry at one or more depths within plow depth.	Infiltration capacity lowered and surface runoff increased due to reduced vegetal cover/retardance. Probe enters soil easily except at rocks. Scattered signs of livestock trails and hoof prints, confined to lanes or small, wet areas.	Infiltration capacity and surface runoff are equal to that expected for an ungrazed meadow; not affected by livestock traffic.
Erosion Sheet and rill	Sheet and rill erosion is active throughout pasture; rills 3–8 inches deep at close intervals and/or grazing terraces are close-spaced with some slope slippage.	Most sheet and rill erosion confined to steepest terrain of unit; well defined rills 0.5–3 inches deep at close intervals and/or grazing terraces present.	Most sheet and rill erosion confined to heavy use areas, especially in loafing areas and water sites; rills 0.5–3 inches deep. Debris fans at downslope edge.	No current formation of rills; some evidence of past rill formation, but are grassed. Scattered debris dams of litter present occasionally.	No evidence of current or past formation of sheet flow or rills.
Rate additional erosion categories below only if present					
Wind	Blowouts or dunes forming or present.	Soil swept from the established pasture being rated causing plant death by burial or abrasion.	Soil swept from adjacent fields or pasture during seedbed prep. and seedling growth to cause pasture plant death by burial or abrasion.	Some vegetative debris windrowed. Some dust deposition from offsite source. Minor wind damage to foliage.	No visible signs of windblown soil or trash. No wind related leaf damage.
Streambank or shoreline	Banks mostly bare and sloughing. No native streambank or shoreline vegetation remaining.	Banks are heavily grazed and trampled all over. Many are actively eroding laterally. Little native streambank or shoreline vegetation. Bank sloughing common.	Banks are close grazed, but few are unstable. Some native streambank or shoreline vegetation remaining. Livestock enter only at specific points, but use heavy. Remote alternative water site present.	Banks are grazed but stable. Mix of pasture plants and native water's edge species. Muddy livestock stream crossing(s) or pond entrance(s) not used heavily. Alternative water sites present.	Banks ungrazed or grazed infrequently. Abundant streambank or shore loving vegetation. Gravelly or constructed stable livestock stream crossing(s) or watering ramp(s). Or, alternative water sources present and close-by.
Gully	Mass movement of soil, rock, plants, and other debris; occurrence of landslides, debris avalanches, slumps and earthflow, creep and debris torrents. Found in mountainous or very hilly terrain.	Gully(s) advancing upslope cutting longer channel(s). Revegetation difficult without using constructed structures & livestock exclusion; continuous gully(s) with many finger-like extensions into the hillside.	Gully(s) present with scattered active erosion, vegetation missing at heavy use slopes and/or on bed below overfalls. New eroding channels present and new overfalls appearing along sides and bed of main channel.	One or more existing stable gullies present, vegetation covers gully bottom and slopes well; no visual signs of active cutting at gully head or sides. Some soil moved in channel bottom.	No gullies; natural drainageways are stable grassed channels. Spring or seep fed bare channels are small and stable, often covered with overhanging vegetation.

Pasture Condition Score Sheet

Farm or ranch site: _____

Date _____

Tear Here

Indicators	Pasture Unit Description									
Percent desirable plants^{1/} Percent plant cover by weight that is desirable forage: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 <20 2 20-40 3 40-60 4 60-80 5 >80 </div>										
Plant cover^{1/ 2/} Percent live, leafy canopy cover of desirables and intermediates is: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 <50 2 50-70 3 70-90 4 90-95 5 95-100 </div> Percent live basal area cover of desirables and intermediates is: <div style="display: flex; justify-content: space-around; font-size: small;"> <15 15-25 25-35 35-50 >50 </div>										
Plant diversity^{1/} The diversity of well-represented forage species is: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 2 3 4 5 </div> (Read criteria and select appropriate number)										
Plant residue^{1/} Ground cover, standing dead forage, or thatch is: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 2 3 4 5 </div> (Read criteria and select appropriate number)										
Plant vigor (Read criteria and select appropriate number) Degree of stress of plant community is: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 2 3 4 5 </div> (If less than 4, see Causative factors table. Rate those factors)										
Percent legume^{1/ 3/} Percentage of legume present as total air dry weight: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 <10, or >60 bloating legume 2 10-19, or 40-60 spreading legume 3 20-29 4 30-39 5 40-60 no grass loss </div>										
Uniformity of use Degree of spot grazing is: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 >50% ungrazed 2 25-50% ungrazed 3 10-25% ungrazed 4 Minor species rejection 5 Urine and dung spots ungrazed </div>										
Livestock concentration areas Presence of livestock conc. areas and proximity to surface water: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 2 3 4 5 </div> (Read criteria and select appropriate number)										
Soil compaction Degree of soil compaction is: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 2 3 4 5 </div> (Read criteria and select appropriate number)										
Erosion (Always rate sheet and rill; others only if present) Sheet and rill, and gully, streambank, shoreline, or wind erosion is: <div style="display: flex; justify-content: space-around; font-size: small;"> 1 Very severe 2 Severe 3 Moderate 4 Slight 5 No visible </div>										
Pasture condition score										

^{1/} Pastureland inventory worksheet helpful.

^{2/} Choose one proper, practical cover type estimation procedure to rate plant cover. The two procedures are not directly comparable.

^{3/} For warm season grass (C4)-legume stands, use the following criteria: 5, 30-40%; 4, 20-29%; 3, 10-19%; 2, 5-9%, and 1 <4%.

Pasture Condition Score Sheet

	Pasture Unit Description									
Causative Factors Affecting Plant Vigor										
Soil fertility (P & K status)* Phosphorus and potassium status of the soil are: <div style="display: flex; justify-content: space-around; width: 100%;"> 12345 </div> (Read criteria and select appropriate number)										
Soil fertility (N status)* Nitrogen status of the grasses is: <div style="display: flex; justify-content: space-around; width: 100%;"> 135 </div> (Read criteria and select appropriate number)										
Soil pH* pH status of the soil for the upper 4-inch root zone best fits: <div style="display: flex; justify-content: space-around; width: 100%;"> 12345 </div> <div style="display: flex; justify-content: space-around; width: 100%;"> ≤ 4.5, or > 9.0 4.5-5.0, or 8.5-9.0 5.1-5.5, or 7.9-8.4 5.6-6.0, or 7.4-7.8 6.0-7.3 </div>										
Severity of use Degree of forage removal is: <div style="display: flex; justify-content: space-around; width: 100%;"> 12345 </div> (Read criteria and select appropriate number)										
Site adaptation of desired species Presence of planted or desired forage species is: <div style="display: flex; justify-content: space-around; width: 100%;"> 12345 </div> (Read criteria and select appropriate number)										
Climatic stresses Degree of plant stress due to recent weather events is: <div style="display: flex; justify-content: space-around; width: 100%;"> 12345 </div> (Read criteria and select appropriate number)										
Insects and disease pressure Degree of plant stress due to insect or disease pressure is: <div style="display: flex; justify-content: space-around; width: 100%;"> 12345 </div> (Read criteria and select appropriate number)										

* Rate electrical conductivity and sodium adsorption ratios in regions where appropriate. Where excess salts, exchangeable sodium, or exchangeable aluminum hinder plant growth they are the controlling factor rather than soil pH conditions. Use appropriate criteria for them as found in the National Range and Pasture Handbook under Evaluating and rating pastures, Pasture Condition Scoring. See pH criteria below for highly weathered soils.

Soil pH Criteria for Major Landuse Resource Areas with Oxisols and Ultisols

pH status of the soil for the upper 4" rooting zone best fits:

1	2	3	4	5
< 4.0, or > 9.0	4.0-4.5	4.5-5.0	5.1-5.5	5.6-6.2
	or, 7.0-9.0	or, 6.5-7.0	or, 6.2-6.5	

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Plant Vigor Causative Factors

Factor	Score				
	1	2	3	4	5
Soil fertility (P & K status) ^{1/}	Very low P & K, or very high P & K.	Low P and K; or low P, very high K; low K, very high P; opt. P, very high K; very high P, opt. K.	Low P, optimum K; or low P, high K; or optimum P, low K; high P, low K; or high P, high K.	Optimum P, high K; or high P, optimum K.	Optimum P and K
(Nitrogen status) ^{2/}	N deficient or excessive.		N marginal or high.		Adequate N.
Upper 4-inch root zone pH ^{3/}	< 4.5 or > 9.0	4.5-5.0 or, 8.5-9.0	5.1-5.5 or, 7.9-8.4	5.6-6.0 or, 7.4-7.8	6.0 to 7.3
Severity of use	All desirable species grazed out. Or no grazing, resulting in thatch and/or standing dead accumulation and woody invasion.	All edible plants grazed to lowest level feasible by the livestock type (mown lawn look). Or, undergrazed - mostly stemmy overgrowth and much dead leaf.	Spot grazing common. Equal amount of close-grazed and little-grazed areas. Close grazed areas are grazed as low as livestock can graze (mown lawn look.)	Some spot grazing, avoided areas primarily at dung and urine spots. Closer grazed areas are not grazed below proper height needed for plant vigor.	Forage species grazed within height ranges that promote dense sward and near maximum production.
Site adaptation of desired species	Properly planted and established (desired) species are no longer present.	Properly planted and established (desired) species are nearly gone. Volunteer unwanted species dominate.	One or more properly planted and established, or recruited desired species are missing. Unwanted species invading.	Properly planted and established, or recruited desired species still represented, but not in the desired proportions.	Properly planted and established, or recruited desired species are present in the desired proportions.
Climatic stresses	Brownout from drought. Or, frost heaved plants, most with severed roots and dying. Or, major loss due to submergence or ice sheets.	Wilted plants, little recovery during night. Or, some frost heaved plants, recovery slow. Some spotty stand loss due to submergence or ice sheets.	Wilting during heat of the day. Or, weak plants from winter damage or short-term submergence. Or, freezing damage to foliage.	Dry conditions, but no wilting. Or, above or below normal temperatures slowing growth. Or, slight leaf yellowing due to cold, wet conditions.	No climatic stress.
Insect and/or disease pressure	Severe insect attack, mortality high. Or, disease caused mortality high.	Insect or disease outbreak at economic threshold, treat now.	Insect or disease outbreak near economic threshold, continue watch and weigh options for treatment.	Some insect and/or disease present, but little impact on forage quality or quantity.	No visible damage.

^{1/} Names used to describe P & K levels not consistent nationwide; Very high referred to as excessive, and optimum as moderate or medium. Determined by approved soil testing procedures and comparing soil test results for exchangeable P and K with this table.

^{2/} Determined using chlorophyll meter or plant tissue test and comparing those results with this table.

^{3/} pH ratings may need to be regionalized to account for soil chemistry differences that influence range of acceptability as soils become more highly weathered or excess salts, exchangeable aluminum, or sodium begin to interfere with forage production. Establish exchangeable aluminum, electrical conductivity, and sodium absorption ratio criteria where their levels in the soil interfere with forage production.

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Guide to Pasture Condition Scoring



Introduction

A well-managed pasture is one whose productivity (plant and animal) is optimized while it does no harm to soil, water, and air quality. Pasture condition scoring is a systematic way to check how well a pasture is managed. If the pasture is located on the proper site and well managed, it will have a good to excellent overall pasture condition score. By rating key indicators and causative factors common to all pastures, pasture condition can be evaluated and the primary reasons for a low condition score identified. Conditions that typically express themselves as pasture resource problems are poor plant growth, weedy species domination, poor animal performance, visible soil erosion, and nutrient runoff and impaired water quality.

Pasture condition scoring, to be most useful, should be done at least once a year during key critical management periods throughout the grazing season.

- When pasture condition is poor
- When planning to place livestock on pasture
- When planning storage supply periods
- When planning base supply periods
- When a problem appears
- When needed to help decide when to remove livestock

In addition, pastures used for year-round grazing benefit from pasture condition scoring:

- Going into the winter season
- Late in winter
- During thaws or wet periods

Pasture condition scoring can be useful in deciding when to move livestock or planning other management actions. It sorts out which improvements are most likely to improve pasture condition or livestock performance.

Pasture condition scoring involves the visual evaluation of 10 indicators, listed and described below, which rate pasture condition. In the *Pasture Condition Score Sheet*, each indicator or factor has five conditions described for it, ranging from very poor to excellent. This objectively ranks the extent of any problem(s) and helps sort out the likely cause(s). Evaluate each indicator separately. They may be combined into an overall score for the pasture unit or left as an individual score and compared with the other nine indicators. Indicators receiving the lowest scores can be targeted for corrective action as warranted. The plant vigor indicator is broken down further into six possible causes that affect plant vigor. As one or more erosion indicators may exist on a site, they are split into four types: sheet and rill, gully, streambank or shoreline, and wind.

Indicator Descriptions

Plants

A pasture has the kind of plants that livestock will graze readily. A pasture is dominated by desired, persistent, and

undesirable species. Undesirable species include annual weeds, broad leaved plants, and plants that are not eaten or are only eaten with difficulty by most livestock or cause undesirable side effects when eaten, and that crowd out more desirable

species. A few forages for a time are undesirable during a specific growth stage when they produce toxins. Intermediate species are those which, while eaten, provide low tonnage or lose quality fast, and often have a short-lived grazing use period. Some examples are dandelions, wild plantains, and annual grasses, such as crabgrass. Estimate visually the proportion of desirable species present in the entire sward by weight, and score accordingly.



Plant cover

The percentage of the soil surface covered by plants is important for pasture production and soil and water protection. A dense stand (high stem count) ensures, when properly grazed, high animal intake and high sunlight interception for best forage growth. Bare, open spots allow for weed encroachment, increased water runoff during intense rains, and soil erosion. Visually estimate the total cover of all desirable and intermediate species. Assign a value based on either green leaf canopy or live vegetative basal area cover percentage. Use the most familiar method that provides a consistent, reliable estimate of plant cover for the pasture being rated.

Canopy cover works best on sod-forming pastures. It can be determined at any time on continuously grazed pastures provided stubble heights greater than 1 inch are present. On rotational pastures, estimate canopy cover of a paddock the day prior to livestock entry. This will represent the best possible condition. If it rates fair or lower at this growth stage, management changes are definitely in order.

Basal area works best on bunch grass pastures. It is hard to use on pastures where sod-forming grasses and broadleaf plants dominate. Estimate by eye or use either the step-point or the point-intercept methods. Basal area is measured by both methods by counting pin hits on live stems and plant crowns at ground level (within 1 inch above). Where it is most useful, basal area is more constant than canopy cover and thus is more reliable.

Plant residue

Plant residue, in various states of decay, provides additional surface cover and organic matter to the soil. However, too much standing dead material in the grass stand reduces the feed value of the forage consumed and animal intake, and inhibits new plant shoot growth. Excessive amounts of standing dead material may cause the forage to be rejected by the grazing animal. Less than 25 percent of the standing forage mass should be dead or dying leaves and stems. Buildup of thatch (mat of undecomposed residue) at the soil surface indicates retarded residue decay. Thatch promotes fungal diseases and retards or prevents shoot and seedling emergence. This results in forage stand decline.

Plant diversity

Plant diversity is the number of different species of plants that are well represented (20% or more of total plant cover) in a pasture. Low species diversity causes season-long pastures, or a set of pastures grazed as a unit, to be less reliable suppliers of forage to livestock during the grazing season. Forage production varies more widely through the grazing season because of changing weather and light conditions and insect and disease pressure. Pastures with high species diversity tend to be older, moderately grazed permanent pastures. Here plants and associated forage species have adjusted to the management and the prevailing environmental stresses, and no single forage species is so dominant as to grow out of control.

Having more than one functional group of plants, either in a pasture or in different pastures of a grazing system is highly important. This management practice ensures a consistent forage supply during the grazing season. Functional groups of forages are plant groupings that have similar growth habits and management needs. The four basic functional groups for improved pastures are cool-season grasses, warm-season grasses, legumes, and other grazable broadleaf plants (e.g., *Brassicas* and forage chicory). These basic functional groups can be split into more specific groups, such as upright versus prostrate and sod-formers versus bunch grasses. However, this extra detail is unwarranted in improved pasture condition evaluations.

Plants from different functional groups are more compatible when they can compete successfully together as managed. Mixed species pastures should contain at least two functional groups and three or more species.

Standing dead residue or mature plants that are senescent cause livestock to selectively graze the green portion of the stand.



represented forage species are generally the most productive. Higher diversity (over six species) does not assure higher productivity. It may actually spur animals to avoid some species and graze others hard, as species differences in palatability and maturity are more likely. Potential forage is wasted. Less desirable species gain in area by outcompeting overgrazed desirable species. However, trying to prevent this selectively by reducing forage on offer and forcing animals to eat everything, reduces intake and gains. This also decreases productivity.

When plant diversity scores low, several courses of action are possible. The appropriate response depends on the region in which the pasture is located, its intended use period, and the species growing in it. Applying other treatment measures may be easier or more advantageous than trying to grow several plant species together, with a single pasture. These measures include:

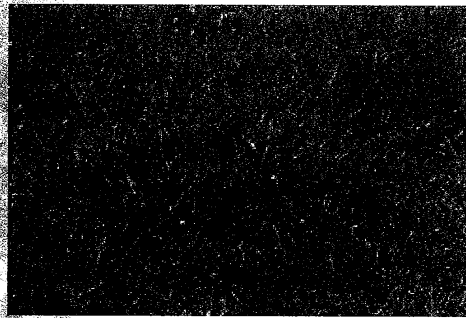
- Applying nitrogen fertilizer to a pasture with few desirable species present.
- Establishing a different forage functional group species composition.
- Converting a perennial crop into a perennial pasture species composition.

When plant diversity is low, it may ultimately be necessary to change the entire plant community. This may be done by introducing new plant species, or by using herbicides to remove undesirable species and then introducing desirable species. When plant diversity is low, it may be necessary to consider some alternative forage sources or to develop a different pasture. Some of the ways of applying N fertilizer, are described below.

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Soil fertility

Adequate, but not excessive, fertility is critical for good plant vigor. Test soil or plant tissue to determine nutrient status. Excessive amounts of nutrients, particularly N, P, and K, can also cause animal health and/or water quality problems. Rank, often lodged, dark green to blue-green forages are a warning sign of excessive soil fertility. Maintain adequate nutrient balance to not exceed maximum economic yield of desirable forage species. In some areas of the United States, excess salts and sodium are often present in the soil at levels that reduce plant vigor. Test those soils for electrical conductivity and exchangeable sodium. Reduce their levels, or plant forage species tolerant of the levels found.



When urine and dung patches are noticeably greener than the rest of the pasture, nutrients are limiting production.

Severity of use

Grazing management is critical in maintaining productive pastures. Close, frequent grazing (mown lawn appearance) often causes loss of vigor reducing yields and ground cover. Low stocking rates promote selective grazing that causes excessive residue build-up (presence of mature seed stalks and dead leaves). This standing residue blocks sunlight, reduces overall forage quality, and favors the spread of less palatable and/or taller, grazing intolerant forages. Assign a value based on the proportion of the pasture grazed closest and the height at which it is grazed. Compare that height to minimum stubble heights recommended for maintaining desired forages.

Site adaptation of desired species

Climate and soil type play a major role in the vigor of a given species. Consider these items when evaluating adaptability:

- cold hardiness
- tolerance to aridness
- summer heat and humidity levels
- frost heave or soil cracking
- soil wetness
- flooding or ponding
- soil acidity or alkalinity
- toxic elements
- salinity
- sodicity
- low or high nutrient levels

Two other factors to consider are the desired species tolerance to existing grazing pressure and soil and water management. Plants that hold their growing point close to the ground can be grazed close provided they are allowed some time between grazing events to push out new leaf area. Others that elevate the growing point into the grazing zone need grazing events timed to release new shoot growth. The presence and balance of desired species are compared with those species present now and their balance. This verifies how well adapted the desired species were to the site, grazing pressure, and management.

Climatic stresses

Extremely wet, dry, hot, or cold weather may threaten plant vigor even when climatically adapted forage species are present. When rating the pasture, consider recent weather events and their role in the present health of a forage stand. Extremely cold and wet weather can cause temporary nitrogen deficiency symptoms (yellowish leaves). A hard winter may weaken the stand. A drought can cause the stand to go dormant. Check for frost or freeze damage to foliage.

Soil pH

Soil pH influences plant vigor primarily through its effect on nutrient availability. It also influences the amount of nitrogen-fixing nodules formed on legume roots. Determine the pH in the surface 3 to 4 inches through a soil test or reliable field methods. Adjust pH to provide optimum yield of desirable forage species.

Note: Reduced yields may continue if the pH in the subsoil is too low or high. Contact a soil fertility or forage management specialist for further management options.

Insect and disease pressure

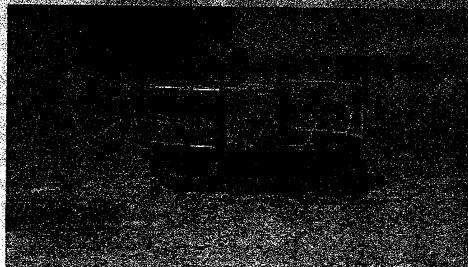
Look for signs of leaf, stem, and root damage caused by insects and disease. Assess their impact on forage quality, quantity, and stand life. Some are chronic, occurring yearly, but with little consequence to the forage stand life. Others take the forage species under attack out of the stand. Corrective actions to take are numerous and specific to the insect or disease involved. Consult with a local, respected forage expert when unsure of proper course of action.

Livestock concentration areas

Concentration areas are places in pastures where livestock return frequently and linger to be near water, feed, mineral or salt, or shelter, or to be in shade. Typically, well-worn pathways lead to these preferred areas. Depending on the degree of usage, these areas are usually bare and receive extra animal waste. Depending on where they are on the landscape and flow paths, they can direct sediment, nutrients, and bacteria to nearby waterbodies.



Heavy use areas, such as around this feed bunk, often wash during heavy rains. Note missing hay residue at the bare spots in foreground.



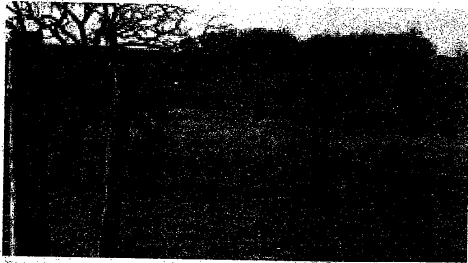
These areas can direct contaminated runoff to surface water, unless there is an intervening grass buffer between them and open channels. Note reed canarygrass riparian area buffer below feed bunk.

Uniformity of use



Spot grazing often occurs where forage growth exceeds livestock intake at least seasonally. Once established, it stays in place unless pattern is destroyed seasonally.

Check uniformity of use by observing animal grazing patterns. Uniform grazing results in all desirable and intermediate species being grazed to a similar height. Spotty or patterned grazing appears uneven throughout a pasture with some plants or parts of paddocks grazed heavily and others lightly. Individual forage species are being selected for or against by the livestock based on their palatability and nutritional value. Selectivity is also affected by forage species stage of maturity differences, amount of forage offered to livestock, and their length of stay in the paddock. Zone grazing occurs



Areas that are grazed close contrasted with areas largely avoided. Several causes exist. The one shown is a deep, entrenched stream barrier and entry choice to pasture.

when one end of the pasture is heavily grazed and the other end is ungrazed or lightly grazed. It occurs on long and narrow pastures and ones that run lengthwise up and down steep slopes. Other pastures that have shady areas, windbreaks, or hay feeding, creep feeding, and watering sites whose location and duration of use at that location skew foraging to one end of a pasture are often zone grazed as well. Physical barriers, such as streams, cliffs, and obstructing fencelines, can confine livestock to one area of a pasture causing zone grazing.

When rating this factor keep in mind that while overgrazing may result in a uniform height (mown lawn appearance), it is to a height lower than that needed to maintain all desirable forage species.

Erosion

Sheet and rill

This erosion is soil loss caused by rain drop impact, drip splash from rainwater dropping off plant leaves and stems onto bare soil, and a thin sheet of runoff water flowing across the soil surface. Sheet and rill erosion increases as ground cover decreases. Evidence of sheet erosion in a pasture appears as small debris dams of plant residue that build up at obstructions or span between obstructions. Some soil aggregates or worm castings may also be washed into these debris dams. Rills are small, incised channels in the soil that run parallel to each other downslope. They join whenever the ground surface warps and deflects the direction of their flow. When rills appear, serious soil loss is occurring. This erosion type also includes most irrigation-induced erosion.

Streambank, shoreline, and gully

This erosion occurs in large, open drainage channels or around shorelines. When in pastures, these channels or shorelines can have heightened erosion problems and losses of vegetative cover that typically grows on them. These heightened damages result from grazing animal traffic in or on them. Open channels may be intermittent or perennial flowing streams or dry washes. The factors that affect the extent of disturbance livestock cause to gullies, streambanks, shorelines, and their associated vegetation are:

- Livestock traffic patterns
- Frequency of use
- Attractiveness of these channels or banks as sunning, dusting, travel lanes, watering, grazing, or rubbing areas
- Channel shape (depth, width, presence and frequency of meanders, and bank stability)
- Flow characteristics (frequency, depth, sediment carried, swiftness, and turbulence)

Wind

Erosion occurs when heavier, windblown soil particles abrade exposed soil and cause dust to become airborne. Deposition of the heavier soil particles occurs downwind of obstructions, such as fencelines, buildings, and vegetation. Often vegetative debris is windrowed against obstructions.

Percent legume

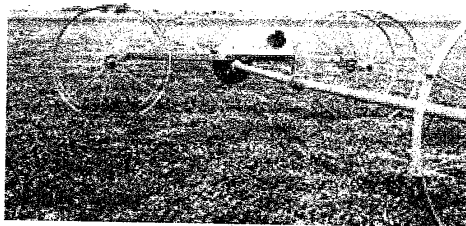
Legumes are important sources of nitrogen for pastures and improve the forage quality of a pasture mix when they comprise at least 20 percent of total air-dry weight of forage. Deep-rooted legumes also provide grazing during hot, dry periods in mid-summer. Visually estimate the percentage of legume present in the total forage mass. Rate this indicator even if site or grass species preclude successful legume establishment and reliable survival to have an effective legume component to fix nitrogen. Most pastures are nitrogen-limited since much of the nitrogen excreted by animals eludes plant uptake. Pastures with few or no legumes present need alternative means of supplying nitrogen for optimum forage production. When bloating legume content is greater than 60 percent of total forage dry weight; bloat incidence in livestock is likely without preventative steps.



Cool-season grass pastures should have 30 percent legume by weight.

Soil compaction

Soil compaction impacts water infiltration rates and runoff. Lack of infiltration decreases water available for plant growth in the soil. Instead, water runs off, increasing channel erosion downstream, and conveys contaminants, such as nutrients, from the site, reducing water quality. Soil compaction is best determined by measuring the bulk density (weight per volume of soil) at 1-inch increments to plow depth. However, compaction can be detected in the field using a soil probe, metal rod, or knife. As these tools are pushed into the soil, compacted soil layers interrupt their ease of penetration. Compare in-field resistance to penetration with resistance found at a grazed fenceline where the livestock cannot stand or walk on the soil surface. The more noticeable the difference in resistance between the two areas is, the worse the compaction is in the pasture.



Avoid grazing pastures too close that causes spreading, bloat-inducing legumes to become dominant (over 60 percent of stand by weight).



Warm-season grass pastures, like this rotationally grazed bermudagrass-white clover, should have 20 percent legume for good livestock performance and nitrogen self-sufficiency.



Wet soils are easily compressed and deformed by livestock hooves.

